Investigating PHYSICS

BOOK II

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Macmillan

INTRODUCTION

At present the emphasis in Science teaching is on the pupils making discoveries by investigation, and on the understanding rather than on the memorization of facts. This workbook has been written with this in mind.

The new approach to the study of Physics demands the active participation of students in the learning process through experimentation. This approach leads to a proper understanding by the students of the basic concepts of Physics and enables the student to discover new ideas.

This book is a workbook. There are 80 activities in it in which the students require everyday materials like cardboard, tins, drawing pins, wooden blocks, springs, etc.

In the exercises, blank spaces have been left for the answers to be written in as they are arrived at. These may be recorded in a separate book with suitable reference numbering, if desired.

I should like to acknowledge my considerable debt to various authors who have inspired me to write this workbook. It is impossible to thank individually the many sources from which experiments and ideas have been drawn.

4th April, 1971 M. P. CHHAYA

FOR THE PUPIL

My name...

My school...

My address..

Date of beginning this workbook...

Date of finishing it..

Teacher's Remarks...

INVESTIGATING PHYSICS

(Based on the Syllabus Prescribed by The National Council of Educational Research and Training, New Delhi)

BOOK II

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CHAPTER I

Motion of Bodies

Activity 1.1

Take a piece of circular cardboard of 15 cm radius. Pass a long nail through its centre so that the head is in front of the card (as shown in Fig. 1.1) and hold it by its pointed end. Fix a pencil at the back of the board and fix a small nail on the front at the rim. Hang a weight by a string. Now rotate the board with the pencil. What do you observe about the motion of the weight? ....

....

....

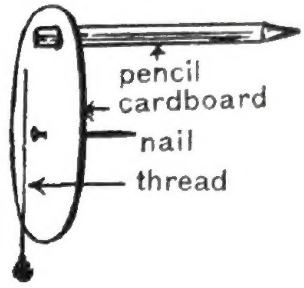

Figure 1.1

What do you observe about the motion of the pencil?

....

Activity 1.2

Take a ball and tie a string to it. Now whirl it round and round. What sort of motion has it? ....

....

Now let loose the string when it is in motion. What sort of motion has it?

....

....

Activity 1.3

Make a pulley from empty cotton reels and stout wire as shown in Fig. 1.2. Cut off the ends of a cotton reel. Stick them together with strong glue. Bind a piece of stout wire to make a hook.

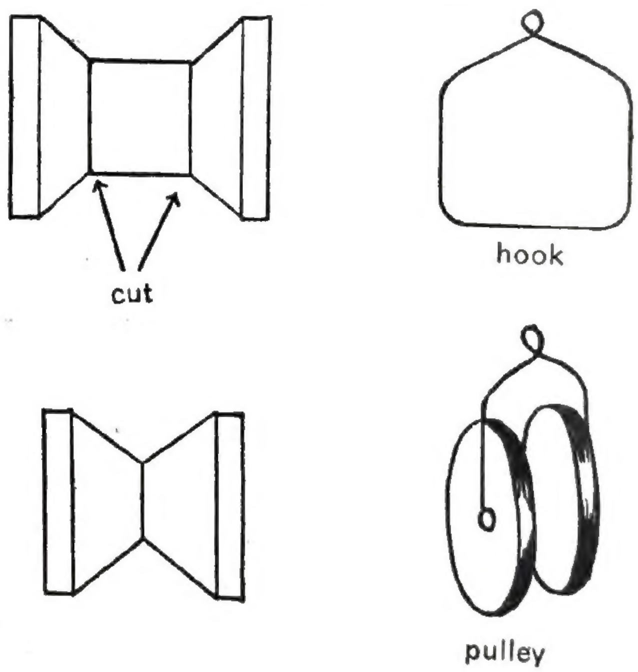

Figure 1. 2

Activity 1.4

By using a pulley try to lift a load (Fig. 1.3). What sort of motion do you observe when (i) the hand pulls the weight? ....

....

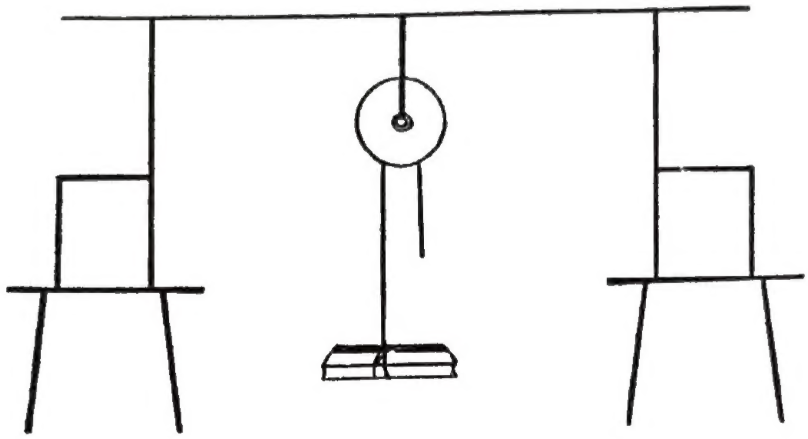

Figure 1.3

(ii) the load is lifted? ....

(iii) the pulley starts? ....

Activity 1.5

Construct a water clock from a burette and use a stop watch to see if the water clock is accurate.

Activity 1.6

Construct a simple sand-glass from a filter funnel and some fine dry sand and use a stop watch to see if the sand glass is accurate.

Activity 1.7

Take a pendulum of 50 cm length and find the time taken for 20 oscillations, using your wrist watch if it has a second hand. Then calculate the period of the pendulum (the time taken for one oscillation is called the period). Now change the length of the pendulum to 75 cm and repeat the process to find the

period at that length. Increase the length to 100 cm and find its period. Tabulate as under:

No. of observation	Length of Pendulum	Time taken for 20 oscillations	Time-Period
1	50 cm	......................Sec.	................Sec.
2	75 cm	......................Sec.	................Sec.
3	100 cm	......................Sec.	................Sec.

What do you conclude? ....

....

....

Activity 1.8

Measure out 30 metres along a corridor and use a stop watch to time your partner (i) walking, (ii) running and (iii) moving at different speeds along the corridor. Calculate his average speed in each case and express it in metres per second.

	Distance	Time taken	Average speed
Walking	30 metres	..............Sec.	..............m/Sec.
Running	30 ,,	..............Sec.	..............m/Sec.
Moving at diff. speeds	30 ,,	..............Sec.	..............m/Sec.

QUESTIONS

Q. 1.1 What is motion ? ....

....

....

Q. 1.2 Give three examples of translatory motion:

(i) ....

(ii) ....

(iii) ....

Q. 1.3 Give three examples of rotatory motion.

(i) ....

(ii) ....

(iii) ....

Q. 1.4 Give three examples which combine both translatory and rotatory motions:

(i) ....

(ii) ....

(iii) ....

Q. 1.5 What sort of motion do you experience when you are cycling?

....

Q. 1.6 Name various types ot clocks:

(i) .... (ii) ....

(iii) .... (iv) ....

(v) ....

Q. 1.7 Give three examples of uniform motion:

(i) ....

(ii) ....

(iii) ....

Q. 1.8 Give three examples of non-uniform motion:

(i) ....

(ii) ....

(iii) ....

Q. 1.9 Ramesh is cycling at a speed of 14·4 km/hour. Express his speed in (i) metres/min and (ii) cm/sec.

(i) ....

....

(ii) ....

....

Q. 1.10 Digant lives at a distance of 3·6 km from his school. He cycles at a speed of 3 m/sec. When should he start from his house to reach the school at 9.30 a.m.?

....

....

....

Q. 1.11 The sound of thunder was heard 5 seconds after the flash of lightning was seen. How far away was the lightning? (The speed of sound is 332 m/sec.)

....

....

....

Q. 1.12 Rupangi runs a 100 metre race in 15 seconds. What is her average speed in km/hr?

....

....

....

Q. 1.13 An Ambassador car and a Fiat car are driven over the same 80 km distance. The Ambassador travels at 50 km/hr all the time. The Fiat starts at the same time, driving at 60 km/hr, but the driver stops for ten minutes after he has travelled for half an hour. Which car is the first to arrive at the destination?

....

....

....

....

Q. 1.14 A car travels at 40 km/hr for 30 minutes and then at 30 km/hr for 30 minutes. (a) How far does it travel?

....

....

....

(b) Find its average speed.

....

....

....

....

CHAPTER II

Inertia of Bodies

Activity 2.1

Take five wooden blocks of the same size and place them one over the other on the table. Now strike the lowest block very quickly with the ruler as shown in Fig. 2.1.

Figure 2.1

What do you observe? ....

....

Go on striking in the same way the lowest block until only one block remains.

Repeat the same experiment by moving the lowest block with a steady push but slowly; what do you observe? ....

....

....

What do you conclude? ....

....

....

Activity 2.2

Place a stack of 5 twenty paise coins on a table and strike this stack with a sixth coin.

What do you observe? ....

....

....

Activity 2.3

Put a piece of cardboard on a jar, with a coin placed over it. Now move the cardboard suddenly with a sharp movement of your finger as shown in Fig. 2.2.

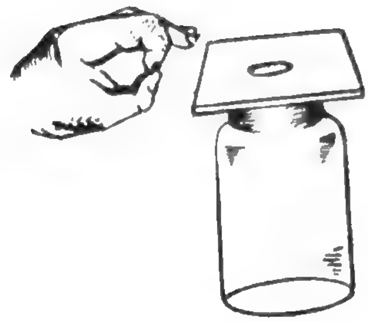

Figure 2.2

What do you observe? ....

....

How do you explain this observation?

....

....

....

Activity 2.4

Take a wooden slide and place a toy trolley over it with one wooden block as a load in it. Keep one block at the base of the slide as shown in Fig. 2.3. Now allow the trolley to roll and to collide with the stationary block. Measure the distance moved by the stationary block after the collision. Repeat the same experiment every time by loading one more wooden block in the trolley and keeping the trolley at the same height. Tabulate it as follows:

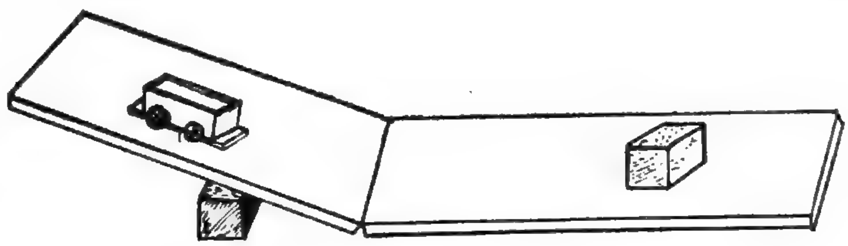

Figure 2.3

S. No.	Trolley loaded with	Distance moved by the fixed block
1	One wooden block	.... cm
2	Two wooden blocks	.... cm
3	Three ,, ,,	.... cm
4	Four ,, ,,	.... cm

What do you conclude? ....

....

....

Activity 2.5

Take a toy trolley and fasten its wheels with the help of a tape so that the wheels do not move. Place a 1 kg weight in it. Fasten one end of the string to the trolley and the other to the hook of the spring balance as shown in Fig. 2.4.

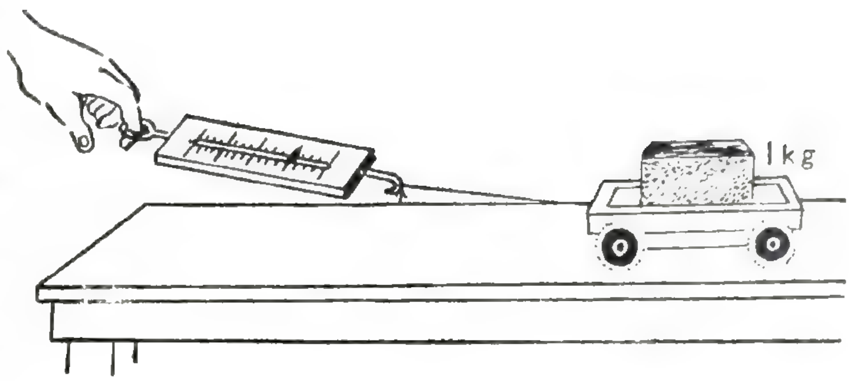

Figure 2.4

Now pull steadily the spring balance.
Note the reading when the trolley starts moving.
Force required to start the trolley=.................. gm.
(This is called the..........................friction.)
With the wheels taped, will it slide or roll? ....
Note the reading when it is in motion. ....
Force required to keep the trolley in motion=.................gm.
(This is called the...............................friction.)
..............................friction is greater than.......................friction.

Now remove the tape from the wheels and repeat the experiment.
Force required to keep the trolley rolling=..........................gm.
(This is called the...............................friction.)
What do you conclude?
....friction is the smallest, while..........................friction is the greatest of the three.

Activity 2.6

Take three small boxes of the same size and shape. Mark them A, B and C. To the bottom of box A, glue a sheet of sand-paper. To the bottom of box B, glue a piece of cloth and to the bottom of box C, glue a piece of smooth paper. Now fill all three boxes with the same amount of sand. Fasten one end of a piece of string to each box in turn and the other end to the hook of the spring balance. Note down the force required to start the boxes moving.

Type of surface in contact	Force required to start the box
Sand paper	.... gm
Cloth	.... gm
Smooth paper	.... gm

What do you conclude? ....

Activity 2.7

Take a small box with its surface glued to a smooth sheet of paper. Place a 1 kg weight in it and find the force required to start the box moving. Repeat it by placing more weights.

Wt. in the box	Force required to start the box	Coefficient of friction
1 kg	.... gm	....
2 kg	.... gm	....
3 kg	.... gm	....

What do you conclude? ....

Activity 2.8

Repeat the experiment described in Activity 2.7 but instead of sliding the box on the table, allow it to roll over the pencils as shown in the Fig. 2.5.

Wt. in the box	Force required to roll the box
1 kg	
2 kg	
3 kg	

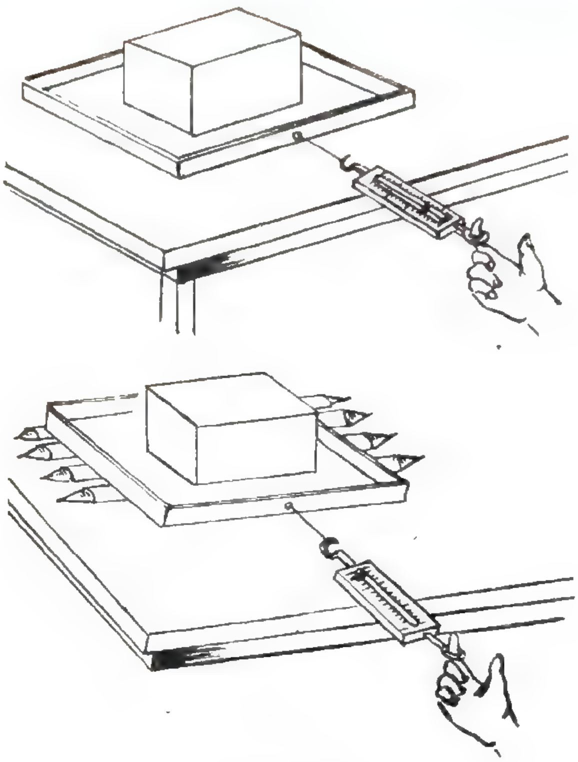

Figure 2.5

What do you conclude after comparing your result with that of Activity 2.7 ?

....

....

....

Activity 2.9

Place a roller skate on the floor. Now put your left foot on the skate and take a quick step forward with the right foot.

In which direction does the roller skate move? ....

....

What do you conclude? ....

....

Activity 2.10

Fill a balloon with air and close the open end with a paper clip so that air will not escape. Attach the balloon with a rubber band to the top of a toy motor car, keeping the open end of the balloon towards the rear of the car. Place the car on the floor and release the paper clip from the balloon.

In what direction does the car move? ....

....

What do you conclude? ....

....

Activity 2.11

Stretch a rubber band in between the thumb and the first finger of your left hand. Now push the rubber band with the first finger of your right hand. What do you feel in your hand? ....

....

....

QUESTIONS

Q. 2.1 Explain the following:

(i) We run for a short distance with a moving bus before getting into it.

....

....

....

....

(ii) When a bus stops, passengers are jerked forward and when it starts, passengers fall backward.

....

....

....

....

Q. 2.2 On a tea-trolley, a tumbler of water is standing as shown in Fig. 2.6. The trolley is moving to the left when it suddenly hits a wall and stops.

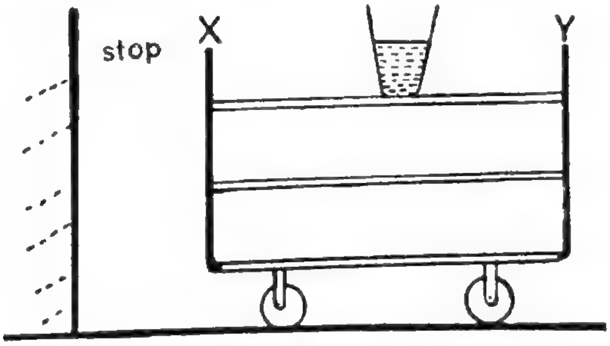

Figure 2.6

(i) If the tumbler slides, which way does it slide?

....

(ii) If the water spills out, without the tumbler falling, on which side does it spill out? (Towards X or towards Y?)

....

(iii) Suppose the tea-trolley is at rest and you wish to spill the water out of the tumbler towards X. What would you do to the trolley?

....

Q. 2.3 Explain:

(i) Why a car is more likely to skid on wet roads than on dry roads.

....

(ii) Why we oil bicycles.

....

(iii) Why the outside of an aeroplane is highly polished.

....

....

(iv) Why some pieces of furniture have little wheels on their legs.

....

Q. 2.4 A force of 35 kg is required to pull a block of wood weighing 140 kg on a rough horizontal surface. Calculate the coefficient of friction.

....

....

....

....

Q. 2.5 Find the horizontal force required to move a body weighing 200 kg over a rough horizontal surface; the coefficient of friction being 0.35.

....

....

....

....

Q. 2.6 Could a rocket propel itself in a vacuum? Explain.

....

....

....

Q. 2.7 Why is it more tiresome to walk on sand than on hard ground?

....

....

Q. 2.8 How do lubricants reduce the friction between two surfaces?

....

....

Q. 2.9 What part is played by friction between the tyres and the road surface when a car is being driven?

....

....

....

....

CHAPTER III

Work and Energy

Activity 3.1

(a) Lift a 5 kg box using a spring balance.
How much force do you exert? ....
Is the box moving in the direction in which you exert the force?
Can you exert more than 5 kg force in lifting the box? ....
If you raise the box slowly and steadily, what force do you exert?
If you raise the box 1 metre, how much work have you done? ....
....

(b) Now place the 5 kg box on a trolley weighing 5 kg and see what force you have to exert to lift both box and trolley.
It is ....
How much work have you done in lifting both of them 1 metre? ....
....

(c) Now place the trolley with the box on the level floor. How much force must you exert to pull the box and the trolley? ....
....
How much work have you done in moving it 1 metre along the floor?
....

Activity 3.2

Weigh yourself and write your weight; .... kg.

Measure the vertical distance from the top floor of the building to the ground floor. It is .... metres. Ask your partner to record the time taken by you to go from the ground floor to the top floor.

You go up as fast as you can. Time taken = ... seconds.

The power you developed in climbing up = ...
....

The horse power you developed = ...

Activity 3.3

Balance a metre stick on the edge of a file as shown in Fig. 3.1. Under which mark of the metre stick does it balance?

....

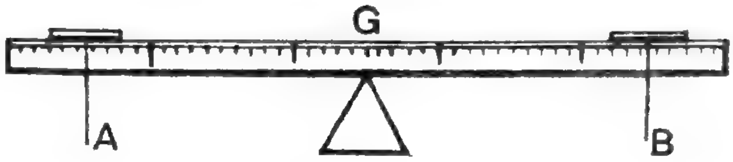

Figure 3.1

(a) Place a twenty paise coin on one side and balance it with a similar coin on the other side. Measure the distances AG and GB.

AG = ... cm; GB = ... cm.

(b) Now place two 20 paise coins on the right hand side, instead of one, and put one coin on the left hand side of G. Balance the stick by moving the coins on the right hand side only. Let this point be C.

Measure GC. It is = ... cm.

(c) Now place two coins on one side and three coins on the other side and balance the stick at G by moving these coins. Let these points be D and E.

DG = ... cm; GE = ... cm.

Tabulate your result:

	Left arm		Right arm	
	No. of coins	Distance of coins from G	No. of coins	Distance of coins from G
(a)				
(b)				
(c)				

What do you conclude? ....

....

....

Activity 3.4

Balance a metre stick as shown in Fig. 3.2. Hang a weight in any position on one side of the beam. Hang a different weight on the other side of the beam and adjust its position until the beam balances. Record the weights and their distances from the fulcrum. Repeat this at least three times using different weights each time. Complete the table.

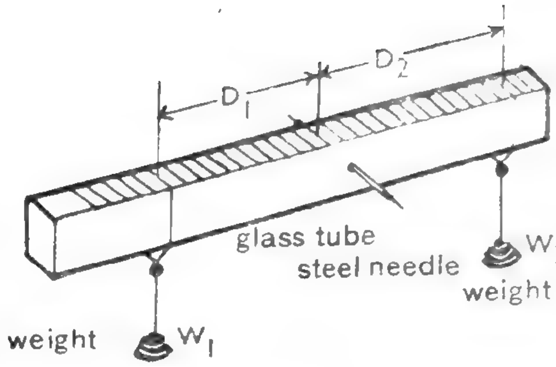

Figure 3.2

WI	DI	WI × DI	W2	D2	W2 × D2
1	2	3	4	5	6

What do you notice about columns 3 and 6?

....

Is it possible to lift a large weight with a small one? ....

What arrangement must you make to do this? ....

....

Activity 3.5

Arrange a metre stick as shown in Fig. 3.3. Adjust the counter-weight until the beam balances. Put on the load W_1. Lift the far end of the beam with a spring balance. This is the effort W_2. Record the weights and their distances from the fulcrum. Repeat this at least three times using different weights each time. Complete the table.

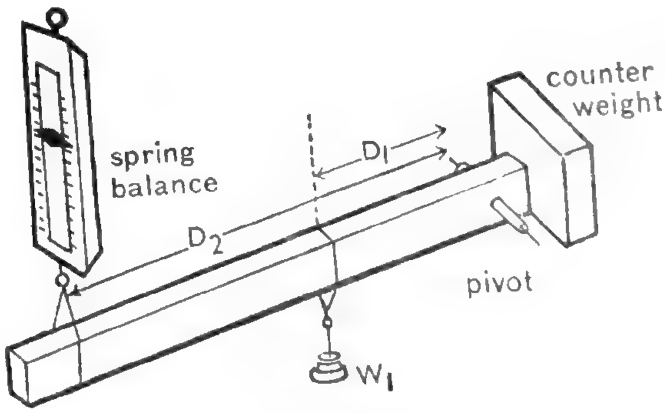

Figure 3.3

W1	D1	W1 × D1	W2	D2	W2 × D2
1	2	3	4	5	6

What do you find now? ....

....

Activity 3.6

Using the same metre stick as shown in Fig. 3.3, change the positions of load and effort, that is, weight and spring balance. Proceed as before and record your results.

What do you notice about columns 3 and 6? ....

....

Can you lift a large weight with a small one using this arrangement? ......

....

Activity 3.7

Place a wooden match on the table. Place a second match across this with its end sticking up. Place the end of a third match across this one, end to end. Place the end of a fourth match across the third near its head. Go on until you have placed eight matches. Now press the last match close to its head.

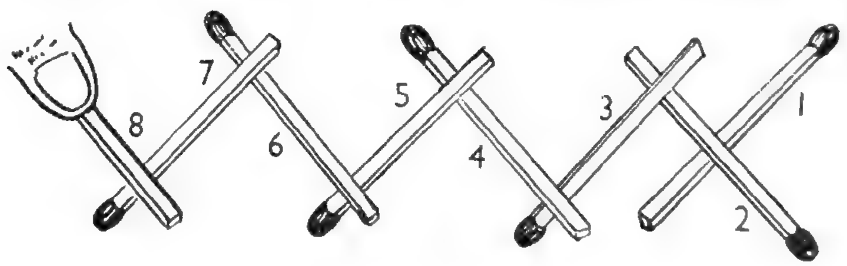

Figure 3.4

How far does your finger move? ....

....

Which matches can you see moving? ....

....

How do you explain this movement? ....

....

Activity 3.8

Set up an inclined plane as shown in Fig. 3.5, with a string from a toy car passing over a cotton reel fixed to the top of the plane. The plane can be adjusted so that it slopes at different angles. Put the weights on the scale pan, and see how the weight needed to pull the car up the plane varies with the angle of the plane.

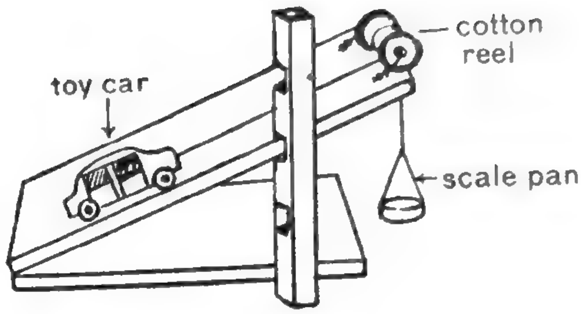

Figure 3.5

At a small angle, the weights required to pull the car = ... gm.

At bigger angle, the weights required to pull the car = ... gm.

At a large angle, the weights required to pull the car = ... gm.

Hence a small angle, i.e., a gentle slope, needs .... weights, but a big angle or steeper slope needs .... weights.

Activity 3.9

Lift a brick from the floor to the table level. What energy have you used in lifting the brick?

....

....

Now tie it to a string and use it to raise a 1/2 kg weight, using a pulley as shown in Fig. 3.6. Can you say that the brick in falling does useful work?

....

....

Since the brick does work while falling from the table level, it possesses some energy.

Name this energy ....

....

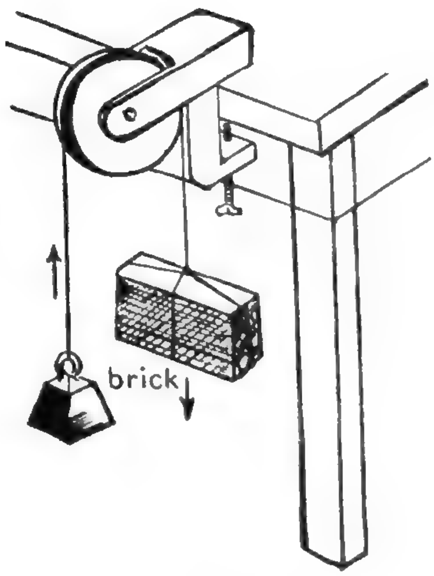

Figure 3.6

Activity 3.10

Take a hardboard of 30 cm × 12 cm and place it on a support as shown in Fig. 3.7. Lift a brick from the floor and allow it to fall from the table level onto the hardboard.

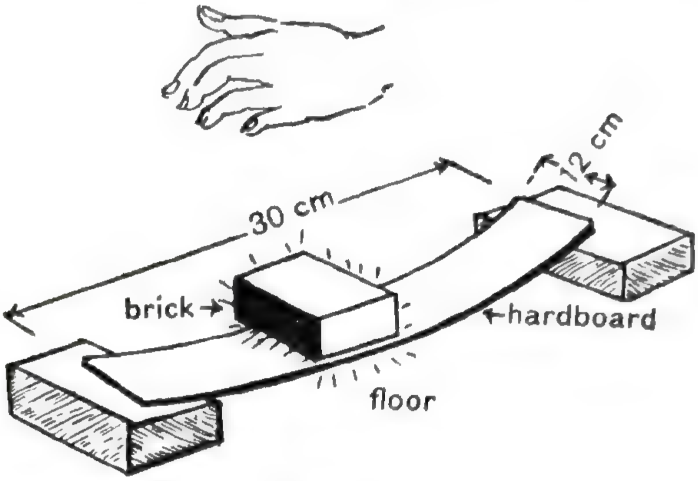

Figure 3.7

What happens to the hardboard? ....

....

What is the reason for this? ....

....

Explain the transformation of energy that took place from time to time you lifted the brick till it came down on the board. ....

....

....

....

....

QUESTIONS

Q. 3.1 A man can pump 150 litres of water per minute to a height of 5 metres. What is the work done per hour?

....

....

....

....

Q. 3.2 Five bricks each weighing 5 kg and 10 cm thick are lying flat on the ground. Find the work done in piling them one over the other.

....

....

....

....

....

Q. 3.3 Calculate the amount of work done against gravity by Jagdeep, who weighs 40 kg, in climbing up the Kutub Minar, its height being 71 metres.

....

....

....

....

Q. 3.4 If clouds are one kilometre above the earth and sufficient rain falls to cover 1 square kilometre at sea level 1 cm deep, how much work was done in raising the water to the clouds?

....

....

....

....

....

Q. 3.5 A man weighing 60 kg lifts a mass of 40 kg to the top of a building 12 metres high in one minute. Find his horse power.

....

....

....

....

....

Q. 3.6 Calculate the H.P. developed when a 20 kg monkey climbs a tree vertically at the rate of 3 metres/sec.

....

....

....

....

Q. 3.7 Find the average H.P. exerted by an oarsman, who pulls with a force of 10 kg weight on the oar and moves the handle through a distance of 2 metres at each stroke and rows at 30 strokes a minute.

....

....

....

....

Q. 3.8 Mechanical work is measured in either .... units or in .... units.

Q. 3.9 Power is measured in the following units:

(i) ....

(ii) ....

(iii) ....

Q. 3.10 Manoj, weighing 50 kg, sits 2 metres away from the centre of a see-saw. How far must his brother, Mayank, who weighs 40 kg, sit from the centre of the see-saw to balance him?

....

....

....

....

Q. 3.11 A crowbar is used to lift a rock weighing 120 kg when the distance from the rock to the fulcrum of the crowbar is 1/2 metre. The effort is applied to the crowbar at a distance of $1\frac{1}{2}$ metre from the fulcrum. What force would be needed to support the rock?

....

....

....

....

Q. 3.12 A pair of pliers is used to cut a piece of wire. The effort applied 12 cm away from the rivet is 2·5 kg and it overcomes a resistance of 30 kg.

(i) Where must the wire be placed? (ii) What is the M.A.?

(i) ....

....

....

(ii) ....

....

....

....

Q. 3.13

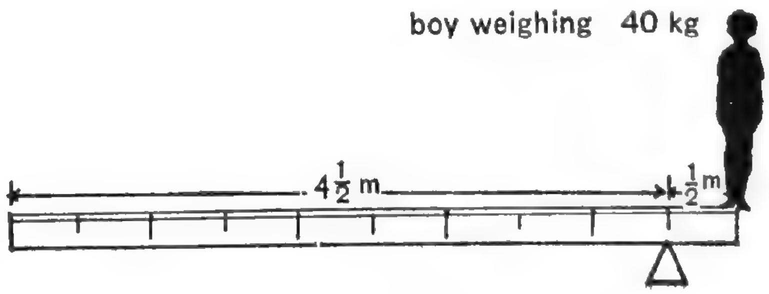

Figure 3.8

In Fig. 3.8 a boy weighing 40 kg is shown standing on the end of a $4\frac{1}{2}$ m long heavy plank. Draw an arrow to show where the weight of the plank acts. If the boy finds that when he is 1/2 m from the pivot the plank balances, what is the weight of the plank?

Q. 3.14 A machine, which has a V.R. of 4 and a M.A. of 3, raises a load of 120 kg through a vertical distance of 10 metres. Calculate:

(i) the effort required;

(ii) the distance moved by the effort;

(iii) work done by the effort;

(iv) work done by the machine;

(v) efficiency of the machine.

Q. 3.15 If you want to load some barrels on to a wagon, will you use a long plank or a short plank? Explain why.

Q. 3.16 Trace the energy changes which take place when:

(i) A pendulum bob is pulled to one side and then allowed to swing.

(ii) An athlete jumps over a bar in a high jump.

....

....

....

(iii) A steam train on a level track starts from rest and is later brought to rest by the application of its brakes. ....

....

....

....

(iv) An electric motor raises a lift from the basement to the top floor. ....

....

....

....

Q. 3.17 Give three examples of bodies possessing potential energy.

(i) ....

(ii) ....

(iii) ....

Q. 3.18 Give three examples of bodies possessing kinetic energy.

(i) ....

(ii) ....

(iii) ....

Q. 3.19 Explain the energy-change taking place during one complete oscillation of a pendulum.

....

....

CHAPTER IV

Oscillatory Motion and Sound

Activity 4.1

(a) Make a long coil of wire and suspend it as shown Fig. 4.1. Tap one end of the coil and watch the effect from the side. If each turn of the coil represents a layer of air, does this help you to understand how sound travels? ....

....

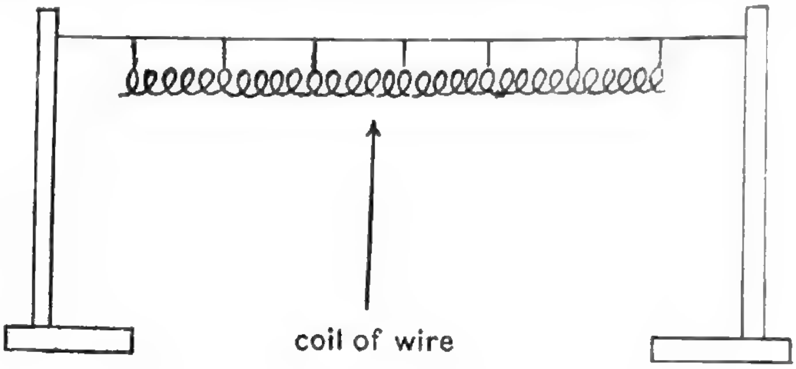

Figure 4.1

(b) Try tapping gently and then more firmly and see if the wave travels more quickly or more slowly because of this: ....

....

....

Activity 4.2

Fix a bristle to one prong of a tuning fork with a piece of tape as shown in Fig. 4.2. Hold a piece of glass over a lighted candle to coat the glass with soot. Lay the glass, coated side up, on a level surface. Draw the bristle along the glass. What type of mark do you observe? ....

....

....

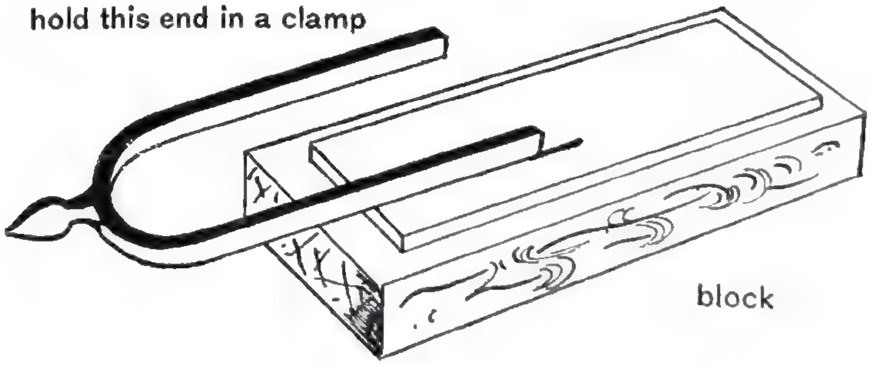

Figure 4.2

Now strike the fork and draw the bristle along once more. Examine the result. ....

....

....

Activity 4.3

Stretch a rubber band between your fingers. Pluck it. Is any sound produced? ....

Does the rubber band vibrate? ....

Now stop it vibrating. Does it then produce sound?

....

Activity 4.4

Place some pieces of paper on a drum. Strike it.

What do you observe? ....

....

What is the reason? ....

Repeat the same experiment and press your hand against the surface of the drum. What do you observe? ....

....

What do you conclude? ....

....

....

Activity 4.5

Take a drinking straw and flatten 3 cm of one end. Cut a tiny strip $1\frac{1}{2}$ cm long from each side as shown in Fig. 4.3. Put the flattened end into your mouth and blow.

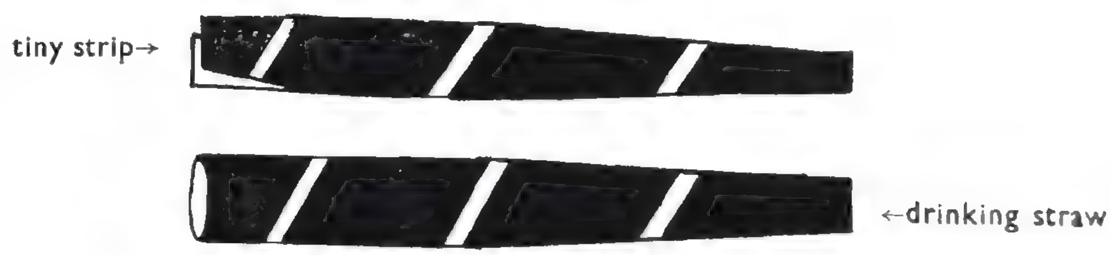

Figure 4.3

What is the reason for the production of sound? ....

....

....

Activity 4.6

(a) Make a simple pendulum, set it swinging from a high starting position, and note the number of swings it makes in one minute. Record the result in the table given. Now start the pendulum from a low starting point. Record

C. P. (II)—4

this result. Increase the weight of the pendulum and try again. Repeat the same experiment with a smaller weight.

Do any of these changes alter the number of swings per minute? ....

....

....

(b) Now change the length of the pendulum and repeat the experiment. Does this affect the result? ....

....

....

Weight of pendulum in gm	Length of pendulum in cm	Starting position	No. of swings per minute

Activity 4.7

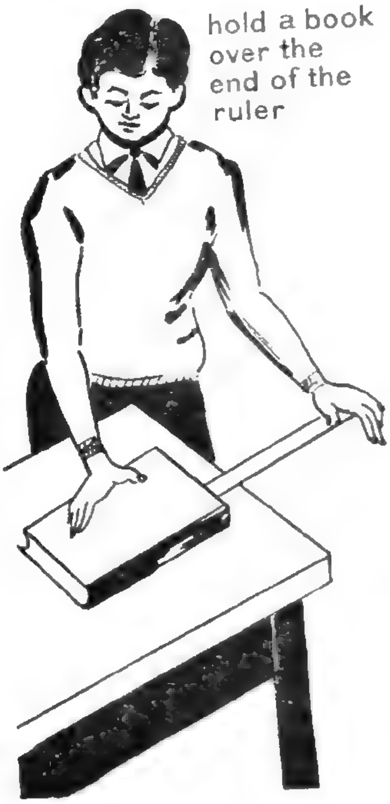

Figure 4.4

Place a ruler as shown in Fig. 4.4, with about 25 cm of its length off the table. Pluck it. Look and listen. Shorten the length by pushing it in about 3 cm. Pluck it again and listen. Continue the experiment pushing the ruler every time by about 3 cm.

(a) Do the vibrations get faster or slower? ....

....

(b) Does the note get higher or lower? ....

....

(c) Repeat the experiment by plucking the ruler harder. Does it make any difference? ....

....

Activity 4.8

Fill eight small test-tubes with different amounts of water as shown in Fig. 4.5. Blow across the mouth of the tubes. Which tubes make the high notes and which the low notes? ....

....

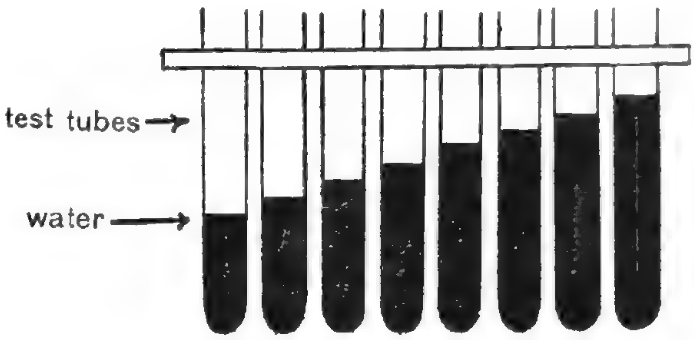

Figure 4.5

Compare the results of the activities 4.6, 4.7 and 4.8:

....

....

....

....

....

Activity 4.9

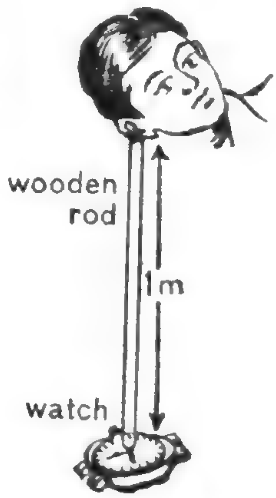

Figure 4.6

Take a wooden rod about one metre long, press your ear against one end and place the other end on a watch as shown in Fig. 4.6. Can you hear the ticking of the watch?

....

Now remove the rod, and listen to the ticking of the watch with your ear at the same distance. Can you hear it? As clearly as before? ....

....

What do you conclude? ....

....

....

Activity 4.10

Figure 4.7

Tie a tablespoon to the middle of a piece of thread. Hold each end of the thread in your fingers and press them against your ears as shown in Fig. 4.7. Ask your friend to tap the spoon with a pencil. What do you hear?

....

....

How does the sound travel to your ears? ....

....

....

Activity 4.11

Take two empty tin cans and make a hole in each. Pass the ends of a piece of thread through the hole in each can. Tie a knot at each end so that the thread will not slip through the holes. Hold one tin and ask your friend to hold the other tin. Make sure that the thread is tight. Send messages to each other by your home-made telephone.

Now hold the string loosely and speak to each other in the tins. Can you hear each other? ....

....

Why is this? ....

....

....

Activity 4.12

Ask your friend to knock two stones together in air. Can you hear the sound? ....

How does it travel? ....

....

Figure 4.8

Now ask him to knock two stones under water in a bucket full of water as shown in Fig. 4.8. Make sure that he does not touch the side of the bucket. Can you hear the sound? ....

How does it travel? ....

....

Activity 4.13

Go out with your friend into a long corridor or play-ground where it is quiet. Now hit a drum or a tin very gently with a stick. Go on doing this as your partner walks away counting his paces until he can no longer hear the sound.

How many paces has he walked? ....

....

Ask your friend to come back to the drum or tin. Strike the drum harder and go on striking as your friend walks away, counting the paces until he can no longer hear it.

How many paces has he walked? ....

....

What do you conclude? ....

....

....

Activity 4.14

Go out into the playing field with your friend and stand at least 150 metres away from him. Ask him to strike a drum or a tin once very loudly, while you watch carefully to see when the stick hits the drum. Notice when you *hear* the stick hit the drum. Do this several times, then change with your friend.

What did you discover? ....

....

....

....

Activity 4.15

Place two cardboard tubes and one drawing board as shown in Fig. 4.9. Hold a ticking watch at the end of one tube. Put the other tube to your ear and move it at different angles to the board, until the ticking sounds loudest.

Look at the position of the two tubes. Compare the angles they make with a line at right angles to the board. What do you observe? ....

....

....

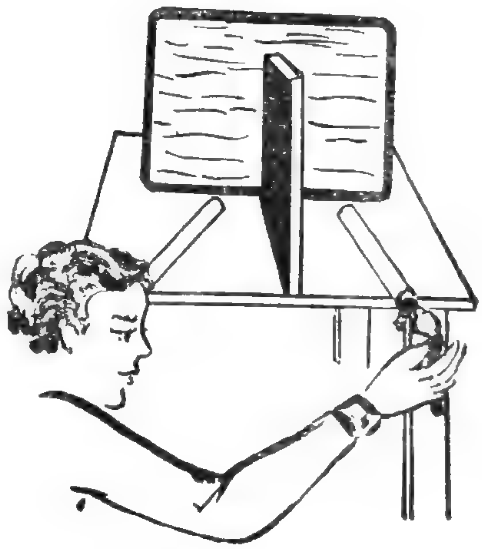

Figure 4.9

Activity 4.16

Ring the alarm of a clock. Note the sound produced. Now fill a big cardboard box with sawdust, or wood shavings or pieces of paper, and set the alarm clock to go off inside the box, surrounded by the stuff inside.

Can you hear it? ....

....

Is there any difference between this sound and the one made in the open?

....

....

....

....

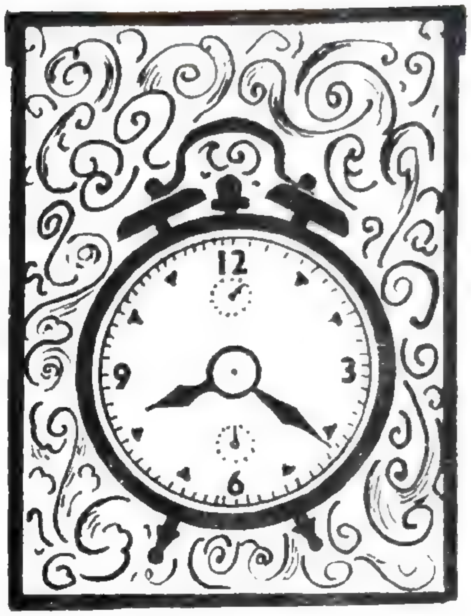

Figure 4.10

QUESTIONS

Q. 4.1 How is sound produced?

....

....

Q. 4.2 How does sound travel? ....

....

....

Q. 4.3 Can sounds be heard on the moon? Give reasons: ....

....

....

Q. 4.4 How does sound help in deep-sea fishing?

....

....

....

Q. 4.5 Why do we see the cause of a distant sound before hearing it?

....

....

Q. 4.6 Gardeners tap plant-pots to determine if the plant needs water. What difference in sound would you expect and why? ....

....

....

....

Q. 4.7 Explain the difference in effect when a sound is produced, first in a heavily-curtained room, and then in a room with bare plaster walls.

....

....

....

Q. 4.8 Explain why a vibrating tuning fork can be heard more clearly when its stem is pressed on to a table. ....

....

....

Q. 4.9 Explain:

(i) When the prongs of a fork are struck against a hard object, a distinct note can be heard.

....

....

....

(ii) There is a difference in effect when a sound is produced in a room with many pieces of furniture and in the same room with the furniture removed.

....

....

....

(iii) Sometimes a dog is seen to prick up its ears. ....

....

....

....

(iv) The time-keeper at a sports meet starts his stop-watch when he sees the smoke from the starter's gun instead of when he hears the sound of the gun. ....

....

....

(v) A carpet placed on the stairs helps to keep a house quiet.

....

....

....

(vi) Sometimes a loud sound such as a thunderclap rattles the windows of a house.

....

....

....

Q. 4.10 If you were watching a cricket match at a distance of about one kilometre from the batsman, how long would it be before you heard the sound of the bat striking the ball?

....

....

....

....

Q. 4.11 During a thunderstorm, a boy notes that he hears the thunder seven seconds after seeing a distant flash of lightning. How far away is the boy from the source of thunder? ....

....

....

....

Q. 4.12 A boy hears a clock on a tower striking four o'clock when he is six kilometres away. If he sets his watch by the sound, how many seconds wrong would he be? ....

....

....

CHAPTER V

Thermal Phenomena

Activity 5.1

(a) Put a coin in a dish of hot water for a minute. Take it out and feel it. Where did the coin get its heat from? ....

....

(b) Put it in a dish of cold water for a minute. Take it out and feel it. Where has the heat gone? ....

....

....

What do you conclude? ....

....

....

Activity 5.2

Stand a metal spoon, a plastic spoon, a glass rod and a pencil in a jar of hot water for about two minutes. Feel against your cheek the top end of each of them that has not been in the water. Which are hot and which are not?

....

....

....

....

Activity 5.3

Trap some ice at the bottom of a hard glass test tube as shown in Fig. 5.1. Hold the test tube in a flame with a test tube holder. Heat the water at the top, until it starts to bubble.

Notice where it bubbles. ....

....

....

....

Carefully feel the bottom of the test tube. What do you notice? ....

....

....

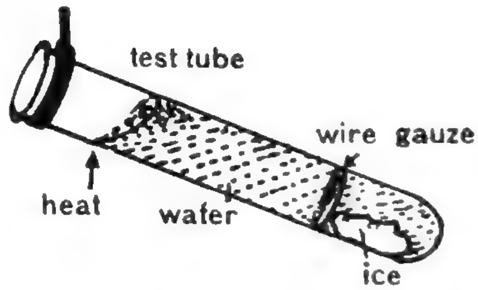

Figure 5.1

What can you say about the ability of water to conduct heat? ....

....

Activity 5.4

Fill a jar to the top with coloured cold water. Fill another jar to the top with hot water (not coloured). Put a thin piece of card over this hot water jar.

Hold the card. Turn the jar upside down and carefully place it on the top of the jar of cold coloured water. Hold the jar and carefully pull away the card. Watch what happens for about two minutes. Write your observation:

....

....

....

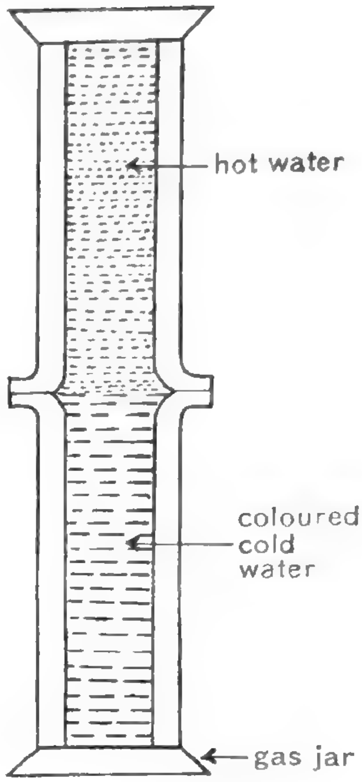

Figure 5.2

Fill the jars as before, using coloured cold water and colourless hot water. Place the card over the cold water and turn the jar with cold water upside down on the top of the hot water. Pull away the card carefully. Watch what happens for about two minutes. Write your observation.

....

....

Activity 5.5

Put some water in a beaker until it is three-quarters full. Heat the water. Put a straw right to the bottom of the beaker and drop one crystal of potassium permanganate down the straw. Take out the straw without disturbing the water. Watch the path of the coloured water. What do you notice? ....

....

....

....

....

....

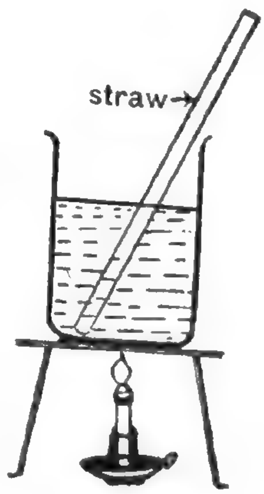

Figure 5.3

Activity 5.6

Make a spiral and a fan from thin cardboard about 5 cm square as shown in Fig. 5.4. Hold first the spiral and then the fan about 15 cm above a candle flame. What happens to them?

....

....

Why? ....

....

....

....

....

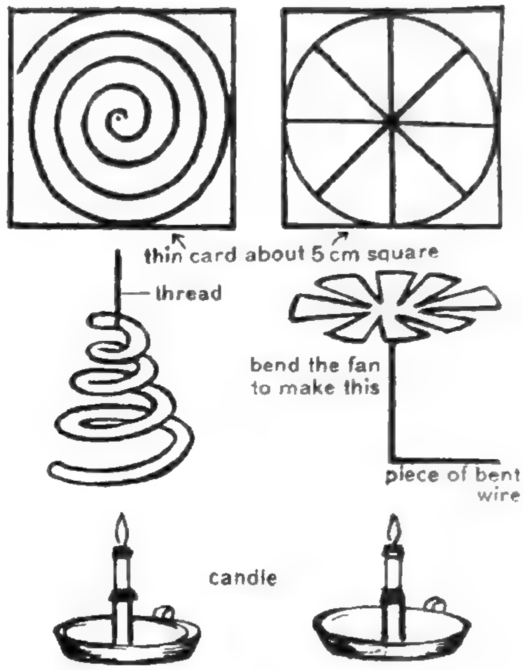

Figure 5.4

Activity 5.7

Light a candle and stand it in a saucer of water. Put a lamp glass over it (or a tin with holes in the top). What happens to the candle?

....

....

....

....

Why? ....

....

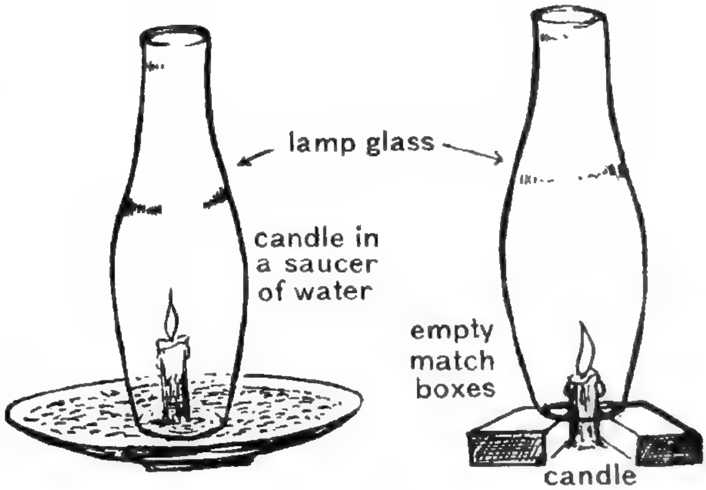

Figure 5.5

Now put the candle between two match boxes as shown in Fig. 5.5. Light it. Put the lamp glass over the candle so that it stands on the boxes.

What do you notice? ....

Why? ....

....

Can you determine the movement of the air? ....

....

Activity 5.8

Light a small candle and lower it with a thin wire into an empty milk bottle. Fit a small T-shaped card in the top of a bottle as shown in Fig. 5.6. Take out the T-shaped card. What happens?

....

....

....

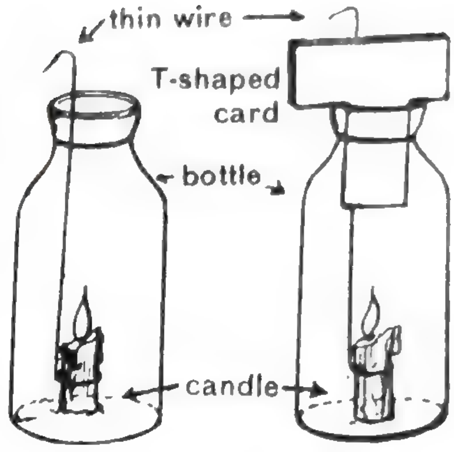

Figure 5.6

Describe the movement of the air when the card is placed in and when the card is taken out.

Activity 5.9

Set up a book in the sun's rays. It throws a shadow. Place one thermometer at the sunny side of the book and another in the shadow of the book. Leave them for about two minutes. What do you notice?

....

....

Does the book stop the heat rays? ....

....

Activity 5.10

Take two similar metal containers (empty jam tins), one of which is painted black and the other white as shown in Fig. 5.7. Fill each with the same quantity of hot water. Take the temperature readings every minute for ten minutes.

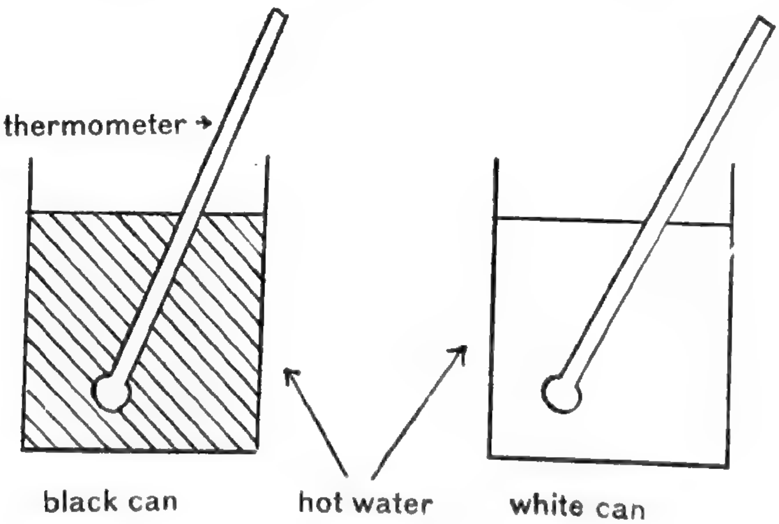

Figure 5.7

Reading after	Reading of the thermometers of	
	black can	white can
1st Minute		
2nd ,,		
3rd ,,		
4th ,,		
5th ,,		
6th ,,		
7th ,,		
8th ,,		
9th ,,		
10th ,,		

What do you conclude? ....

....

....

Activity 5.11

Use the two containers of Activity 5.10. Fill each with the same quantity of cold water. Arrange them so that they are at the same distance from a candle flame as shown in Fig. 5.8. Take the temperature readings every minute for ten minutes.

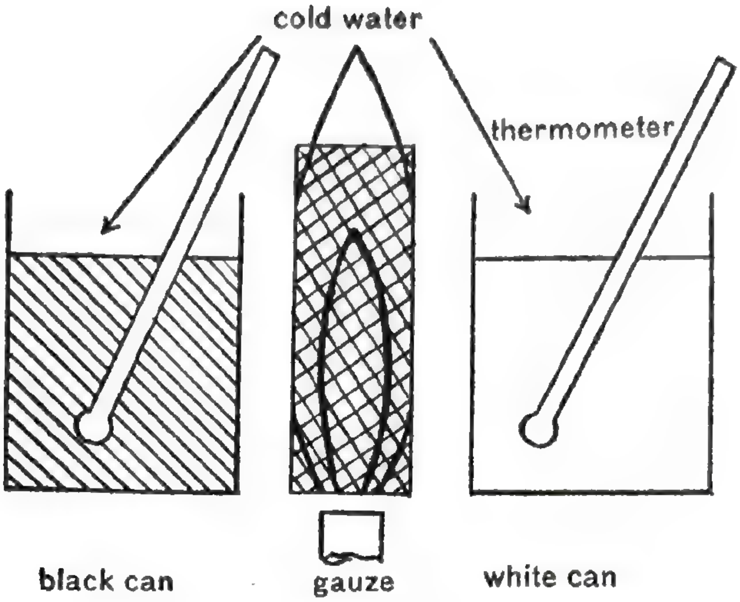

Figure 5.8

Reading after	Reading of the thermometers of black can	white can
Ist Minute		
2nd ,,		
3rd ,,		
4th ,,		
5th ,,		
6th ,,		
7th ,,		
8th ,,		
9th ,,		
10th ,,		

What do you conclude? ....

....

....

Activity 5.12

Figure 5.9

Fill a jar having a screw top with hot water. Record the temperature. .... Screw on the top. Place the jar inside a cardboard box and surround it with wood shavings, sawdust, paper or woollen material. Leave it for two hours. Take out the jar. Record its temperature again.

....

....

How many degrees have been lost? ....

Repeat the same experiment, leaving the jar to stand in the room. Record its temperature every half hour.

Time	Temperature
In the beginning	
After 1/2 hour	
,, 1 hour	
,, 1½ hour	
,, 2 hours	

What do you discover from your results?

....

....

....

Activity 5.13

Stand close enough to a fire to feel its heat on your face. Hold sheets of iron, glass and cardboard in turn between your face and the fire.

(a) With the iron, can you feel the heat as strongly, less strongly or not at all? ....

(b) With the glass, can you feel the heat as strongly, less strongly or not at all? ....

(c) How does heat travel from the fire to your face? ....

....

What do you conclude? ....

....

....

QUESTIONS

Q. 5.1 A beaker of cold water is placed on a tripod and gauze and is gently heated till the water boils. A thermometer is immersed throughout and the water gently stirred.

Explain each of the following observations:

(i) First the beaker gets cloudy outside. The water is still cold.

(ii) The water gets a little warmer and the cloudiness clears away.

(iii) Small bubbles are seen in the water. They rise to the surface. The temperature is still well below 100°C, but a mist is seen above the surface.

(iv) Large bubbles rising rapidly to the surface are seen and plenty of steam is coming off.

(i) ....

....

(ii) ....

....

(iii) ....

....

(iv) ....

....

Q. 5.2 Explain why it is much hotter a few centimetres above a burner flame than at the same distance from the side of the flame. ....

....

....

Q. 5.3 A woollen blanket can prevent a block of ice melting on a hot day and can keep a person warm on a cold day. Explain. ....

....

....

Q. 5.4 Why is a vacuum the worst conductor of all?

....

....

....

Q. 5.5 (i) Should a kettle have a polished surface or a dull black one?

(ii) Why are buildings painted white?

(i) ....

....

(ii) ....

....

Q. 5.6 Why does a piece of metal feel colder than a piece of wood, although they both have the same temperature? ....

....

....

Q. 5.7 Polar explorers wear string vests. Do they wear them, because: (i) they keep the cold out, (ii) they are cheaper, (iii) they prevent heat escaping from their bodies, (iv) they are lighter?

Explain your answer.

....

....

....

Q. 5.8 In order to attain the smallest possible loss of heat by conduction, would it be best to surround an object with rubber, cotton-wool, asbestos, or a vacuum? Give a reason for your answer. ....

....

....

Q. 5.9 Birds fluff up their feathers in cold weather. Why does this keep them warmer? ....

....

....

Q. 5.10 Explain why in sunshine, dirty snow melts more quickly than clean snow.

....

....

....

Q. 5.11 My grandmother says it is silly to take ice-cream for a picnic in a vacuum jar, because everyone knows that these are specially made to keep things hot. What do you say, and how do you justify your reply?

....
....
....
....

Q. 5.12 By what means does energy travel to you when you are warmed by: (i) the sun, (ii) a hot bath, (iii) a gas fire, (iv) an electric heater, (v) a hot water bottle in contact with your feet and (vi) hot food burning your mouth?

(i) ....
....

(ii) ....
....
....

(iii) ....
....

(iv) ....
....

(v) ....
....

(vi) ....
....

Q. 5.13 Explain why water pipes burst in winter in Kashmir.

....
....
....
....
....

CHAPTER VI

Heat and Work

Activity 6.1

(a) Take a piece of sand paper and rub it on a small piece of wood very vigorously. What do you observe? ....

....

....

(b) Rub the palms of your hand together very vigorously. What do you feel?

....

....

What do you conclude? ....

....

What is the source of heat? ....

....

Activity 6.2

Take a cycle pump and use it to pump air into a cycle tube.
Touch the barrel of the pump.
What do you feel? ....
What is the source of heat? ....

....

Activity 6.3

(a) Take a nail and hammer it vigorously for some time. What do you observe? ....

(b) Take a rubber band and stretch it suddenly while it is in contact with your lips. What do you feel? ....

....

(c) Take a metal wire and bend it back and forth several times quickly. Touch the wire. What do you feel? ....

....

What is the source of heat? ....

....

Activity 6.4

Take a metal tube about 2 cm in diameter and 15 to 20 cm long with one end of it closed. Put some water in it and firmly plug the open end with a rubber stopper. Hold the tube with tongs over a flame so that its lower end is heated. After a few minutes, the water inside the tube boils. Hold the tube over the fire a little longer. What do you observe? ....

....

Explain your observation: ....

....

....

Activity 6.5

(a) Put a large piece of metal into a beaker of boiling water. Leave it for 3 or 4 minutes. Now carefully transfer it to a beaker covered with lagging or wool containing 200 gm of cold water, as shown in Fig. 6.1. Note the rise in temperature.

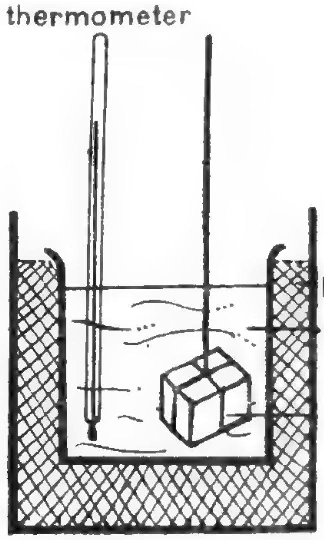

Figure 6.1

Wt. of water = w = ... gm.

Temperature of water before inserting the metal = ... °C.

Temperature of water after inserting the metal = ... °C.

Rise in temperature = t =
Amount of heat received = w × t = ...

(b) Repeat this experiment with a piece of the same metal of half the volume of the first.
Amount of heat received = ...
What do you conclude? ....

....

....

Activity 6.6

Repeat the experiment of activity 6.5 (a) but this time use two different metals, say brass and iron, of exactly the same volume.

Wt. of water = ... gm.
Rise in temperature of water = ... °C
Heat given by brass = ...
Wt. of water = ... gm.
Rise in temperature of water = ... °C
Heat given by iron = ...
What do you conclude? ....
....
....

Activity 6.7

Take 100 cc of cold water. What is the weight? .... gm.
Find the temperature .... °C.
Take 100 cc of hot water. What is the weight? .... gm.
Find the temperature .... °C.
Pour the hot water into the cold water and stir well. Measure the temperature of the mixture. .... °C.
What is the amount of heat lost by hot water?
....
....
What is the amount of heat gained by cold water?
....
....
What do you conclude? ....
....
....

Activity 6.8

Take 50 gm of cold water at room temperature.
Temperature = ... °C.
Take 50 gm of kerosene at room temperature.
Temperature = ... °C.
Heat them equally by putting them into a tub of hot water for a specified time.
Temperature of water = ... °C.
Temperature of kerosene = ... °C.
Heat gained by water = ...
....
Heat gained by kerosene = ...
....

How will you calculate the specific heat of kerosene from the above observations?

....

....

....

....

....

Activity 6.9

(a) Take 200 gm of cold water and measure its temperature.
It is .... °C. Take a spirit lamp and weigh it; .... gm. Heat the water till its temperature rises by 50 degrees. Stop heating and find the weight of the spirit lamp. It is .... gm. What is the weight of the spirit used? .... gm.

(b) Repeat the same experiment using a candle instead of a spirit lamp.
Weight of the candle before heating = ... gm.
Weight of the candle after heating the water 50 degrees = ... gm.
Weight of the candle used? .... gm.

What can you say about the thermal efficiency of the spirit lamp and of the candle?

....

....

....

....

....

Activity 6.10

Make a rotary wheel as shown in Fig. 6.2. Use an empty tin with a tight lid with a hole in it as a boiler. Pour a little water into the tin and heat it. Direct the jet of steam from the boiler onto the plates of the rotary wheel.

What do you observe? ....

....

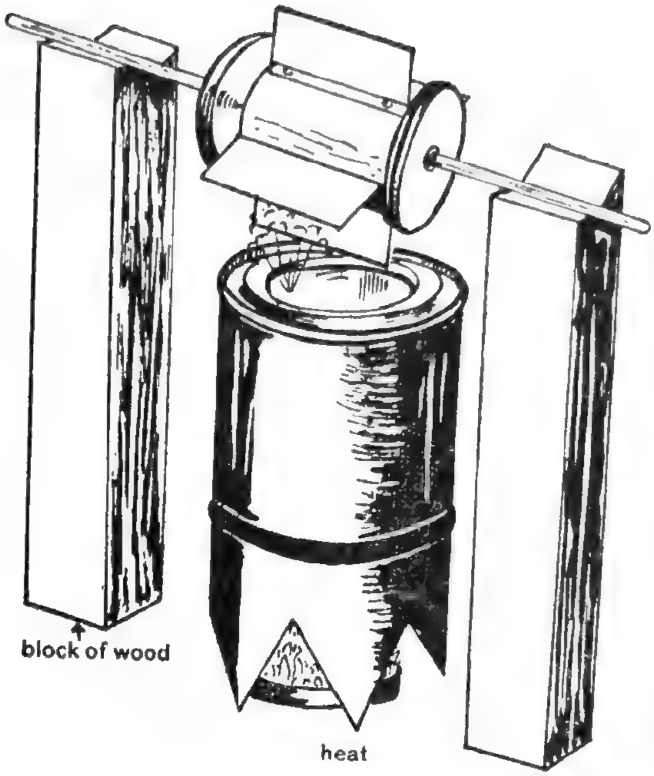

Figure 6.2

How do you account for the energy-changes taking place at every stage?

....

....

....

....

How can this movement be transmitted to make other things move?

....

....

QUESTIONS

Q. 6.1 Explain why the water at the bottom of a waterfall is slightly warmer than the water at the top. ....

....

....

....

Q. 6.2 Explain the fact that a piece of steel becomes steadily hotter as a hole is drilled in it. ....

....

Q. 6.3 What do you think is likely to happen to a meteorite when it enters the earth's atmosphere? ....

....

....

....

Q. 6.4 Why is the hazard from meteorites much greater for a space traveller than for people on the earth's surface? ....

....

....

Q. 6.5 How does the specific heat of water compare with the specific heat of other liquids? ....

....

Q. 6.6 What are the measurements required for the determination of specific heat of a body by the method of mixtures? ....

....

....

Q. 6.7 How would you estimate the approximate temperature of a bunsen flame, using a piece of copper of mass 10 gm and specific heat 0.1? Briefly explain your procedure. ....

....

....

....

....

....

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Q. 6.8 A piece of iron weighing 100 gm is warmed through 10°C. How many grams of water could be warmed through 1°C by the same amount of heat? (The specific heat of iron is 0.1)

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Q. 6.9 500 gm of water at 15°C is mixed with 100 gm of water at 10°C. Find the temperature of the mixture. ....

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Q. 6.10 One gram of coal when burnt gives 700 calories. To what temperature would the burning of one kilogram of coal raise 50 kg of water at 30°C?

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Q. 6.11 50 gm of water at 90°C were mixed with 40 gm of cold water; the final temperature was found to be 58°C. What was the temperature of the cold water?

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Q. 6.12 It was found during an experiment that when 1.5 gm of coal were burnt the heat produced raised the temperature of 500 gm of water from 15°C to 35°C. Find the calorific value of coal.

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Q. 6.13 Two identical masses of copper were heated to 90°C and separately transferred to 100 gm of water at 10°C and to 100 gm of alcohol at 10°C. What do you think about the rise in their temperatures?

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Why? ....

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Q. 6.14 100 gm of lead at 10 C and 100 gm of iron at 10 C are heated up to 90C. Which do you think will require more heat? and why?

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Q. 6.15 How many kilograms of kerosene will give the same amount of K-Cal of heat as that supplied by 33 kilograms of firewood?

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Q. 6.16 If the cost of 1 kg of coal is 50 paise and that of 1 kg of kerosene is 70 paise, which is more economical as a source of heat? Give your reason.

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Q. 6.17 The thermal efficiency of a steam engine is 20%. What does this mean?

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CHAPTER VII

Transition of Substances from One Aggregate State into Another

Activity 7.1

Melt some paraffin wax and allow it to cool in a measuring cylinder.

What do you see on its upper surface when it is solidified?

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Has it greater volume when it is in a solid state or in a liquid state?

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Activity 7.2

Put some small pieces of ice into a flask. Fill the flask with water. Mark the water level near the top of the neck. Warm the flask gently to melt the ice. Observe the water level as the ice melts.

What do you observe? ....

....

....

Which has the greater volume, ice in a solid state or in a liquid state?

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Activity 7.3

Take a beaker and fill it with small pieces of ice. Put a thermometer in it. What is its temperature? .... °C. Heat it as shown in Fig. 7.1 and stir it thoroughly so that there may be uniform temperature inside the beaker. Observe the temperature till the whole of the ice is melted. What do you observe?

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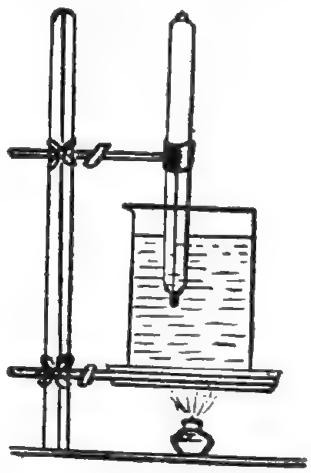

Figure 7.1

Continue to heat it after the ice has melted. What do you observe now? ....

....

What is the melting point of ice? ....

Activity 7.4

Take a beaker and fill it with small pieces of ice. Add some salt. Put a thermometer in it. What is the temperature? .... °C. Now heat as shown in Fig. 7.1, stirring thoroughly so that there may be uniform temperature inside the beaker. Observe the temperature till the whole of the ice is melted. What do you observe?

....

....

What is the melting point of impure ice? .... °C.

Activity 7.5

Place a block of ice on two stands as shown in the Fig. 7.2. Pass a copper wire over it. Attach a weight of 2 kg to this wire. Look at the wire. What happens to the wire? ....

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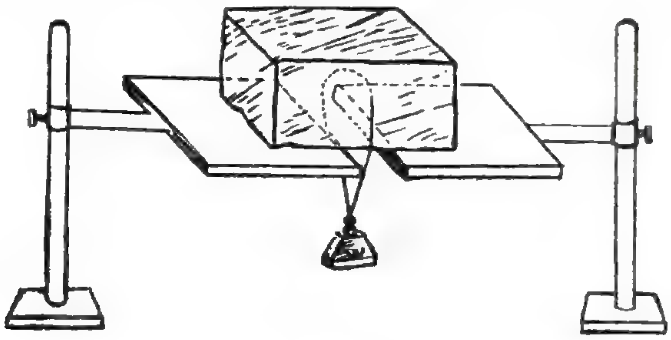

Figure 7.2

What happens to the piece of ice? ....

....

....

Activity 7.6

(a) Take two lids of empty tins of the same size. Put the same amount of water in each of these lids. Gently heat one and leave the other cool. Which dries up the sooner? ....

....

(b) Take two empty cups of the same size and pour in cold water to a depth of 2 cm into each of these cups. Place one cup in a cupboard and

the other under a fan. From which cup does the water evaporate more quickly? ....

....

(c) Take a bottle with a narrow mouth and a saucer. Pour an equal amount of water into both. Leave them open for some time and then measure the volume of water in the bottle and in the saucer.

From which does the water evaporate more quickly?

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What do you conclude from these three experiments?

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Activity 7.7

(a) Take two wide-mouth bottles of the same size. Fill one bottle full and the other half-full both with hot water. Leave them standing for five minutes and find their temperatures. What do you observe?

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Figure 7.3

(b) Fill the same two wide-mouth bottles with hot water. Place one bottle in a dish containing cold water. Leave them standing on a table for five minutes as shown in Fig. 7.3. Find their temperatures. What do you observe?

Activity 7.8

Put a little water in a test tube and place it in a beaker containing ether. Blow air through the ether thus causing it to evaporate.

What happens to the water in the test tube?

....

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Why? ....

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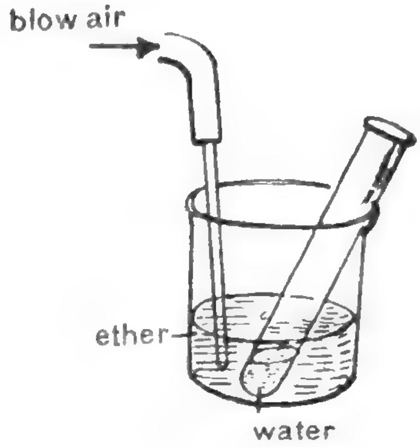

Figure 7.4

Activity 7.9

Place the lid of an empty tin on a few drops of water on the table. Now pour some ether onto the lid and blow air through it.

What happens to the lid? ....

....

Why? ....

....

....

Activity 7.10

Take a flask, fill it half-full with water, and place it on a gauze on a stand. Heat the water until it is boiling. Put a thermometer into the flask, holding the bulb just above the surface of the water and measure the temperature of the steam every thirty seconds for three minutes. Measure this temperature rather than that of the water itself, because dissolved substances can change the temperature. There are no dissolved substances in the steam.

Record the temperature at the end of:

30 seconds .... ; 60 seconds .... ;
90 seconds .... ; 120 seconds .... ;
150 seconds .... ; 180 seconds .... ;

What do you notice about these temperatures?

....

....

Activity 7.11

Take a flask and fill it half-full with water. Insert a thermometer and heat the flask till it begins to boil. Record its temperature .... C. Now add two or three spoonfuls of salt to the boiling water. What do you observe?

....

Go on heating till it starts boiling again.
Record the temperature .... °C.
What do you conclude? ....

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Activity 7.12

Boil some water in a round-bottomed flask and when the steam has driven out the air, firmly stopper the flask and immediately remove the burner. Invert the flask as shown in Fig. 7.5 and when the water stops boiling pour some cold water over the top. What happens inside the flask?

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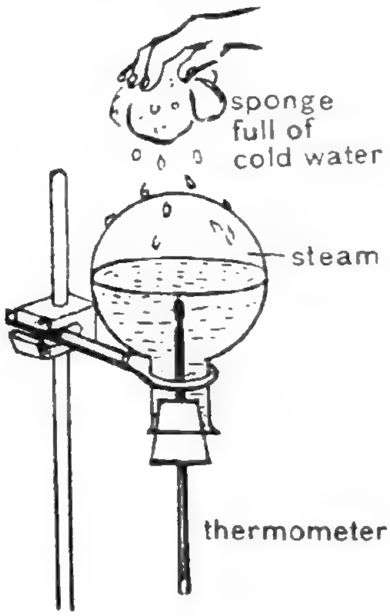

Figure 7.5

What happens to the pressure inside the flask?

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What is the lowest temperature at which you find the water still boiling?

....

QUESTIONS

Q. 7.1 Explain why water can be kept cool in hot weather, by storing it in a porous pot: ....

....

Q. 7.2 What happens to the melting point of ice when:

(i) it contains salt, ...

(ii) the pressure on it is increased? ....

....

Q. 7.3 Explain why steam at 100°C may produce a more severe burn than boiling water: ....

....

....

Q. 7.4 Mention four factors that influence the rate of evaporation of water in a beaker:

(i) ....

(ii) ....

(iii) ....

(iv) ....

Q. 7.5 A thermometer whose bulb has been dipped in petrol is waved in the air. Does its reading change? If so, why? ....

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Q. 7.6 Explain why a film of moisture forms on the outside of a glass of cold water when it is brought into a warm room: ....

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Q. 7.7 Name three substances which you have seen melting when they were heated:

(i) ....

(ii) ....

(iii) ....

Q. 7.8 Name a metal which is liquid at normal room temperature: ....

....

Q. 7.9 Explain why you cannot boil an egg on the top of a very high mountain?

....

....

Q. 7.10 If a lump of ice is floating on a tumbler filled to the brim with water, will the water overflow when the ice melts? Explain: ....

....

....

....

Q. 7.11 Would you cool a can of water more quickly by placing it on ice or placing ice in it? Explain: ....

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Q. 7.12 How much heat is needed to melt 50 gm of ice at 0°C?

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Q. 7.13 If water at 60°C is mixed with an equal mass of ice at 0°C, find the final temperature ....

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Q. 7.14 A tray containing 1 litre of water at 30°C is placed in a refrigerator which extracts heat from the water at the rate of 2,500 cal. per min. How long will it take to freeze all the water to ice at 0°C?

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Q. 7.15 Why do athletes when wet with perspiration protect themselves from draughts? ....

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Q. 7.16 Hot curry makes you perspire. Would you therefore prefer it in a hot dry or a hot humid climate? Why? ....

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Q. 7.17 Why does a dog's tongue hang out on a hot day? ....

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Q. 7.18 Potatoes are boiling in a saucepan. Will more heat cook the potatoes more quickly? Why? ....

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Q. 7.19 If water is boiled in a pressure cooker, would the boiling point be greater or less than 100°C? Why? ....

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Q. 7.20 What do you understand by volatile substances?

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....

Give three examples of volatile substance:

(i) ....

(ii) ....

(iii) ....

Q. 7.21 Calculate the quantity of heat required to convert 50 gm of ice into water at 20°C.

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Q. 7.22 Find the amount of heat required to convert 20 gm of ice at 0°C into steam at 100°C.

WHAT HAVE WE FOUND OUT?

Activity 1.1 and **Activity 1.2**	Motion can be either translatory or rotatory.
Activity 1.3	The making of a simple rotating pulley.
Activity 1.4	The motion can be either translatory or rotatory.
Activity 1.5 and **Activity 1.6**	Time is measured in terms of the intervals at which a particular phenomenon repeats itself.
Activity 1.7	If the length of the pendulum is increased the time period also increases.
Activity 1.8	Average speed can be found out by dividing the distance travelled by the time taken.
Activity 2.1 and **Activity 2.2**	The larger the mass of the body at rest, the greater is the effort needed to move that body.
Activity 2.3	A body continues in its state of rest unless it is acted upon by a force.
Activity 2.4	The bigger the mass of a body, the greater its inertia.
Activity 2.5	Rolling friction is least, static friction is greatest.

Activity 2.6	Friction depends upon the roughness of the surfaces in contact.
Activity 2.7	The coefficient of friction does not depend on the weight.
Activity 2.8	Sliding friction is greater than rolling friction.
Activity 2.9 to Activity 2.11	Action and reaction between two bodies are equal in magnitude, but opposite in direction and in the same straight line.
Activity 3.1	Work done $=$ force $\times$ distance moved.
Activity 3.2	Horse power $= \dfrac{\text{wt. in kg} \times \text{dist. in metre}}{\text{time in seconds} \times 76}$
Activity 3.3	Force on left side $\times$ length on left arm of the lever $=$ Force on right side $\times$ length on right arm of lever.
Activity 3.4 to Activity 3.6	The clockwise and anticlockwise movements about the fulcrum are equal.
Activity 3.7	To achieve a greater gain in force, more levers are used.
Activity 3.8	If the length of the inclined plane is greater than its height, a smaller force is required to move the body in the upward direction.
Activity 3.9 and Activity 3.10	Energy can be changed from one form to another.
Activity 4.1	Compressions and rarefactions are produced in the coil. Sound travels in the same way.
Activity 4.2	The tuning fork produces an oscillatory motion.
Activity 4.3 to Activity 4.5	All vibrating bodies produce sound.

Activity 4.6	The period of a pendulum does not depend upon the amplitude or upon the mass, but depends upon the length.
Activity 4.7	Vibrations are faster when the length is shortened and so the note is higher.
Activity 4.8	The note is higher, when the length of the air column is reduced.
Activity 4.9 to **Activity 4.11**	Sound waves travel through solids.
Activity 4.12	Sound waves travel through liquids.
Activity 4.13	The loudness of a sound depends upon the amplitude of oscillations of the source of sound.
Activity 4.14	Sound waves travel more slowly than light waves.
Activity 4.15	Sound can be reflected.
Activity 4.16	Some materials absorb sound.
Activity 5.1	Hot bodies lose heat and cold bodies gain heat.
Activity 5.2	Metals are good conductors of heat; plastic, wood and glass are bad conductors of heat.
Activity 5.3	Water is a bad conductor of heat.
Activity 5.4	Cold water is heavier than hot water.
Activity 5.5	Hot water is lighter than cold water.
Activity 5.6	Warm air rises.
Activity 5.7 and **Activity 5.8**	Hot air rises in the lamp glass, drawing fresh air after it through the flame. A candle will burn fast if the air inlet is wide open and slowly if it is nearly closed.

Activity 5.9	Heat rays coming from the sun are cut off by the book.
Activity 5.10	More heat is radiated by a black body than by a white body.
Activity 5.11	More heat is absorbed by a black body than by a white body.
Activity 5.12	Wood, paper and wool are bad conductors of heat.
Activity 5.13	Heat in the form of radiation is absorbed by cardboard.
Activity 6.1 to **Activity 6.3**	When mechanical work is done against friction, the body is heated.
Activity 6.4	Heat energy changes to mechanical energy.
Activity 6.5	The amount of heat given by hot bodies depends on the size of the bodies.
Activity 6.6	Different metals of the same volume hold different amounts of heat.
Activity 6.7	Heat lost by a hot body equals heat gained by a cold body.
Activity 6.8	Kerosene reaches a higher temperature than water, if the amount of heat received by them is the same.
Activity 6.9	The thermal efficiency of a spirit lamp is higher than that of a candle.
Activity 6.10	Heat energy changes to mechanical energy.
Activity 7.1	Solid wax has a smaller volume than liquid wax.
Activity 7.2	Ice has a greater volume than the same mass of water at 0°C.
Activity 7.3	The temperature at which ice melts is called its melting point.
Activity 7.4	The melting point of impure ice is lower than the melting point of pure ice.

Activity 7.5 The wire passes through the block of ice, without breaking the piece.

Activity 7.6 The rate of evaporation depends upon:

(i) the temperature of the liquid.

(ii) the speed of motion of air over the surface of evaporating liquid.

(iii) the area of the free surface of the liquid.

Activity 7.7 The rate of evaporation depends upon the temperature of the liquid and its mass.

Activity 7.8 and Activity 7.9 The water freezes because ether has taken away the heat from the water.

Activity 7.10 The boiling point remains constant.

Activity 7.11 The boiling point of impure water is higher than that of pure water.

Activity 7.12 The boiling point of water can be lowered by decreasing the pressure over it.

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